WE CLAIM:

1. A sputtering target made by a process including casting having a target surface with the following characteristics:

a) substantially homogenous composition at any location;

b) substantial absence of pores, voids, inclusions and other casting defects;

c) substantial absence of precipitates;

d) grain size less than about $1 \mu m$; and

e) substantially uniform structure and texture at any location.

2. A sputtering target according to claim 1 comprising Al, Ti, Cu, Ta, Ni, Mo, Au, Ag, Pt.

3. A sputtering target according to claim 1 comprising Al and about 0.5 wt.% Cu.

4. A method for fabricating an article suitable for use as a sputtering target comprising the steps of:

a. providing a cast ingot;

b. homogenizing said ingot at time and temperature sufficient for redistribution of macrosegregations and microsegregations; and

c. subjecting said ingot to equal channel angular extrusion to refine grains therein.

5. A method according to claim 4 further comprising, after subjecting said ingot to equal channel angular extrusion to refine grains therein, manufacturing same to produce a sputtering target.

6. A method according to claim 4 wherein said ingot is subject to 4 to 6 passes of equal channel angular extrusion.

7. A method of making a sputtering target comprising the steps of:

a. providing a cast ingot with a length-to-diameter ratio up to 2;

b. hot forging said ingot with reductions and to a thickness sufficient for healing and full elimination of case defects;

c. subjecting said hot forged product to equal channel extrusion; and

d. manufacturing into a sputtering target.

8. A method of fabricating an article suitable for use as a sputtering target comprising the steps of:

a. providing a cast ingot;

b. solutionizing heat treating said cast ingot at temperature and time necessary to dissolve all precipitates and particle bearing phases; and

c. Equal channel angular extruding at temperature below aging temperatures.

9. A method according to claim 8 further comprising manufacturing to produce a sputtering target.

10. A method according to claim 4 including:

a. homogenizing the ingot;

b. hot forging of the ingot; and

c. Equal channel angular extruding forged billet.

11. A method according to claim 7 including:

a. hot forging the ingot; and

b. equal channel angular extruding the forget billet.

12. A method according to claim 10 further comprising producing a sputtering target.

13. A method according to claim 11 further comprising producing a sputtering target.

14. A method according to claim 1 further comprising a solutionizing heat treatment prior to equal channel angular extrusion.

15. A method according to claim 1 further comprising water quenching after homogenizing.

16. A method according to claim 7 including:

a. heating the cast ingot before forging at a temperature and for a time sufficient for solutionizing;

b. hot forging at a temperature above solutionizing temperature; and

c. water quenching the forged billet immediately after forging.

17. A method according to claim 4 including:

a. cooling the ingot after homogenizing to a forging temperature above the solutionizing temperature;

b. Hot forging at a temperature above the solutionizing temperature; and

c. water quenching the forged billet immediately after forging step.

18. A method according to claims 4, 7 or 8 including aging after solutionizing and water quenching at a temperature and for a time sufficient to produce fine precipitates with an average diameter of less than 0.5 μm.

19. A billet for equal channel angular extrusion of targets fabricated from a cast ingot of diameter do and length ho which has been forged into a disc of diameter d_o and thickness h_o and from which two segments from two opposite sides of forged billet to provide a billet width A have been removed in such a manner that thickness H corresponds to the thickness of the billet for equal channel angular extrusion, the wide A corresponds to the dimension of square billet for equal channel angular extrusion, and dimensions of the cast ingot and the forged billet are related by the formulae:

$$D=1.18A$$

$$d_o{}^2h_o=1.39.A^2H$$

20. A method according to claims 4, 7 or 8 in which the step of equal channel angular extrusion is performed at a temperature below the temperature of static recrystallization and at a speed sufficient to provide uniform plastic flow, and for a number of passes and routes that provides dynamic recrystallization during processing.

21. A method according to claims 5, 9 or 13 including annealing after final target fabrication at the temperature which is equal to the temperature of the sputtered target surface during steady sputtering.

22. A method according to claim 13 in which annealing after final target fabrication is performed gradiently by exposing the sputtered target surface to the same heating

condition and exposing an opposite target surface to the same cooling condition as under target sputtering during a sufficient time for steady annealing.

23. A method according to claim 22 in which gradient annealing of the target is performed directly in a sputtering machine at sputtering conditions before starting a production run.

24. A method according to claims 4, 7 or 8 in which the step of equal channel angular extrusion include a first extrusion with 1 to 5 passes into different directions intermediate annealing at a low temperature and for a time sufficient to produce very fine precipitates of average diameter less than about 0.1 μm, and a second extrusion with a sufficient number of passes to develop a dynamically recrystallized structure.

25. A method for controlling texture of sputtering targets by a process according to claim 4 wherein the step of equal channel angular extrusion is performed by changing the number of passes and billet orientation between successive passes in a manner to produce a desired final texture strength and orientation.

26. A method for controlling texture of sputtering targets by a process according to claim 5 wherein the step of equal channel angular extrusion is performed by changing the number of passes and billet orientation between successive passes in a manner to produce a desired final texture strength and orientation.

27. A method for controlling texture of sputtering targets by a process according to claim 8 wherein the step of equal channel angular extrusion is performed by changing the number of passes and billet orientation between successive passes in a manner to produce a desired final texture strength and orientation.

28. A method according to claim 25 including a preliminary processing performed before extrusion to produce strong original texture of the same orientation as of the desired final texture after equal channel angular extrusion.

29. A method according to claim 25 including the additional step of recovery annealing performed between extrusion passes at temperatures below the temperature of static recrystallization.

30. A method according to claim 25 including the additional step of recovery annealing after equal channel angular extrusion at temperatures below the temperature of static recrystallization.

31. A method according to claim 25 including the additional step of recrystallization annealing performed between extrusion passes at a temperature equal to the beginning temperature of static recrystallization.

32. A method according to claim 25 including the additional step of annealing performed after the step of equal channel angular extrusion at a temperature equal to the beginning temperature of static recrystallization.

33. A method according to claim 25 including the additional step of recrystallization annealing performed between extrusion passes at temperature above the temperature of full static recrystallization.

34. A method according to claim 25 including the additional step of recrystallization annealing performed after the step of equal channel angular extrusion at temperatures above the temperature of full static recrystallization.

35. A method according to claims 4, 7 or 8 wherein at least different types of thermal treatments are performed between extrusion passes and after the final step of equal channel angular extrusion.

36. A method according to claim 4, 7 or 8 further comprising a thermal treatment for control of grain size and distribution of second phase particles.

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